

and the light having the third wavelength band, which is incident on the plurality of third pixels.

[0016] Adjacent first color separation elements may be positioned to have an angle of about 90 degrees with respect to each other.

[0017] The plurality of second pixels arranged in the first pixel row and the plurality of second pixels arranged in the second pixel row may be arranged in a first diagonal direction, and the plurality of first pixels in the first pixel row and the plurality of third pixels in the second pixel row may be arranged in a second diagonal direction crossing the first diagonal direction.

[0018] The first color separation elements may extend in at least one of the first diagonal direction and the second diagonal direction.

[0019] A first separation element among the first color separation elements may include a first sub-color separation element that extends in the first diagonal direction and a second sub-color separation element that extends in the second diagonal direction.

[0020] The image sensor may further include second color separation elements arranged to respectively face the plurality of first pixels and the plurality of third pixels and may allow the light having the second wavelength band, among the incident light, to pass therethrough and travel in the lateral direction, and may allow the mixture of the light having the first wavelength band and the light having the third wavelength band to pass therethrough and travel in the downward direction.

[0021] Adjacent first and second color separation elements may be positioned to have an angle of about 90 degrees with respect to each other.

[0022] The plurality of second pixels arranged in the first pixel row and the plurality of second pixels arranged in the second pixel row may be arranged in a first diagonal direction, the plurality of first pixels in the first pixel row and the plurality of third pixels in the second pixel row may be arranged in a second diagonal direction crossing the first diagonal direction, and the first and second color separation elements may respectively extend in at least one of the first diagonal direction and the second diagonal direction.

[0023] The plurality of second pixels arranged in the first pixel row and the plurality of second pixels arranged in the second pixel row may be arranged in a first diagonal direction, the plurality of first pixels and the plurality of third pixels may be arranged in a second diagonal direction crossing the first diagonal direction, and a first color separation element and a second color separation element may respectively include a first sub-color separation element that extends in the first diagonal direction and a second sub-color separation element that extends in the second diagonal direction.

[0024] The image sensor may further include a transparent dielectric layer on the pixel array, wherein the first color separation elements are positioned in the transparent dielectric layer, and the first color filter is between the pixel array and the transparent dielectric layer.

[0025] According to an aspect of an exemplary embodiment, there is provided an image sensor including: a pixel array including a first pixel row, in which a plurality of first pixels and a plurality of second pixels are alternately arranged, and a second pixel row, in which a plurality of second pixels and a plurality of third pixels are alternately arranged; color separation elements arranged to respectively

face the plurality of first pixels and the plurality of third pixels, the color separation elements being configured to allow light having a second wavelength band, among incident light, to pass therethrough and travel in a lateral direction, and to allow a mixture of light having a first wavelength band and light having a third wavelength band, among the incident light, to pass therethrough and travel in a downward direction; and first color filters on at least a portion of the plurality of first pixels, the first color filters being configured to transmit only the light having the first wavelength band.

[0026] The light having the second wavelength band may pass through the color separation elements and may be incident on the plurality of second pixels arranged in the first pixel row and the plurality of second pixels arranged in the second pixel row, and in the first pixel row, the mixture of the light having the first wavelength band and the light having the third wavelength band may pass through the color separation elements and may be incident on the first color filters, and in the second pixel row, the mixture of the light having the first wavelength band and the light having the third wavelength band may pass through the color separation elements and may be incident on the plurality of third pixels.

[0027] The image sensor may obtain an intensity of at least one of the light having the first wavelength band, the light having the second wavelength band, and the light having the third wavelength band, based on the light having the first wavelength band and which is incident on the plurality of first pixels, the light having the second wavelength band and which is incident on the plurality of second pixels arranged in the first pixel row and the plurality of second pixels arranged in the second pixel row, and the mixture of the light having the first wavelength band and the light having the third wavelength band, which is incident on the plurality of third pixels.

[0028] The image sensor may further include third color filters on a first portion of the plurality of first pixels, the third color filters being configured to transmit only the light having the third wavelength band, and the first color filters may be arranged on a second portion of the plurality of first pixels, and the first color filters and the third color filters may be alternately disposed on the plurality of first pixels.

[0029] A color separation element may be positioned to have an angle of about 90 degrees with respect to another color separation element.

[0030] The plurality of second pixels arranged in the first pixel row and the plurality of second pixels arranged in the second pixel row may be arranged in a first diagonal direction, and the plurality of first pixels in the first pixel row and the plurality of third pixels in the second pixel row may be arranged in a second diagonal direction crossing the first diagonal direction.

[0031] The color separation elements may extend in at least one of the first diagonal direction and the second diagonal direction.

[0032] A color separation element among the color separation elements may include a first sub-color separation element that extends in the first diagonal direction and a second sub-color separation element that extends in the second diagonal direction.

[0033] The image sensor may further include a transparent dielectric layer located on the pixel array, wherein the color separation elements are positioned in the transparent dielectric